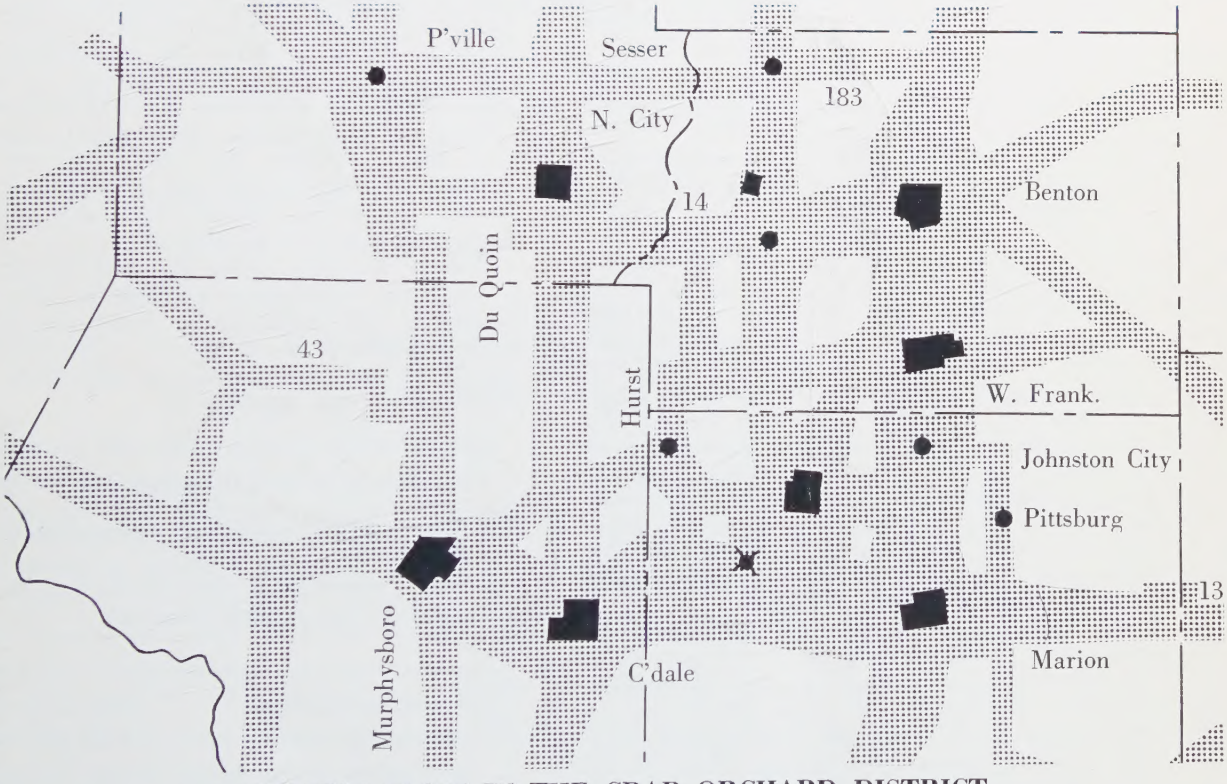
# SOUTHERN ILLINOIS business bulletin

UNIVERSITY OF ILLINOIS
LIBRARY
SEP 20 1961
CHICAGO

SOUTHERN ILLINOIS UNIVERSITY — SCHOOL OF BUSINESS
Vol. 11, No. 3 — Summer, 1961 — Carbondale, Illinois




TRAFFIC FLOW IN THE CRAB ORCHARD DISTRICT

- CARTERVILLE: A CASE STUDY OF EMPLOYMENT AND COMMUTING
- A NEW WAY TO COMPUTE ACCELERATED DEPRECIATION

# THE EMPLOYMENT STRUCTURE AND COMMUTING PATTERN OF CARTERVILLE, ILLINOIS

**by Leland E. Newman**

*Introduction to Problem*

In Southern Illinois many employees commute to work. That is, they live in one community and travel to other cities to their jobs. The purpose of this study is to show the importance of commuting in Southern Illinois by using Carterville as a case study. Carterville's employment structure was analyzed with emphasis being placed on the importance of commuting employees.

For purposes of this study, those cities within an area bounded by Pinckneyville, Benton, Marion, and Murphysboro will be known as the Crab Orchard district. Within this district there are approximately 150,000 to 200,000 people and a cluster of 15 to 20 small cities of 2,000 to 14,000 population. Carterville is located nearly in the center of this cluster of cities (see Figure 1), slightly north of Highway 13, with good access to five other cities of around 10,000 population within a 15-mile radius. In 1950 Carterville had a population of 2,716 and the present population is around 2600.

The Crab Orchard district has no central or primate city. Instead, there are the many small cities which are functionally dependent on one another. The traffic pattern shown by Figure 1 reveals a large volume of intercity traffic compared to the traffic volume leaving the district. This intercity traffic indicates commuting, which exists for a number of reasons. The university at Carbondale undoubtedly generates commuting for educational and employment purposes. The Ordill manufacturing area generates commuting for employment purposes. Other commuting traffic, in addition to employment, includes shopping trips made to various communities, and social, religious, and recreational trips. This report will deal only with Carterville commuter traffic generated by employment.

On the basis of the automobile traffic map, the Crab Orchard district may be viewed as a single economic unit composed of cities serving different functions. Historically, each city within the area was considered as a separate entity with its activities centered around coal mining. With the decline of employment in mining, people and cities have had to readjust themselves and find new means of economic support.

---

*Leland E. Newman has prepared this article from graduate work he has taken in geography at Southern Illinois University. A similar article about West Frankfort by Robert Harper, chairman of Southern's Geography Department, and William Sanders appeared in the Summer, 1956, issue of the* Southern Illinois Business Bulletin.

*Historical Relation Between Carterville and Coal Mining*

Carterville was named after Laban Carter, who in 1864 discovered the coal deposits which were to be very important in the future development of the city. The activity associated with mining enabled the people of this area to obtain a city charter in 1892.

Like other communities in southern Illinois which began as coal mining towns, the population of Carterville grew rapidly with the expansion of the coal mining industry. From Table I (page 4) it can be seen that the population of selected southern Illinois cities increased prior to 1920 and decreased during the period of 1930 to 1950. During these same periods of population increase and decrease, employment in mining showed similar fluctuations. Figure 2 shows that activity connected with coal mining in Williamson County reached its peak in 1920 and declined rapidly in the succeeding two decades. From 1940 to the present, coal production has increased while the number of employees in that activity has not increased comparatively, because mechanization in the industry and competition from other fuels have made it unnecessary to employ large amounts of manpower. Tons of coal and the number of employees in mines giving Carterville post office addresses also decreased and have reached a low ebb at the time of this report. Carterville's population, however, no longer is declining but appears to be leveling off.

Thus, it has been shown that even though there is not much employment available in mines near Carterville, the population of Carterville still has been maintained. It remains to explain how this population has been maintained and where these people have found employment.

*Method Used to Analyze Carterville Employment*

The information used to analyze Carterville's employment structure is twofold. The first portion is based on a survey of business establishments and the second portion on a survey of homes within Carterville. Both the home and the business data were obtained by personal interview.

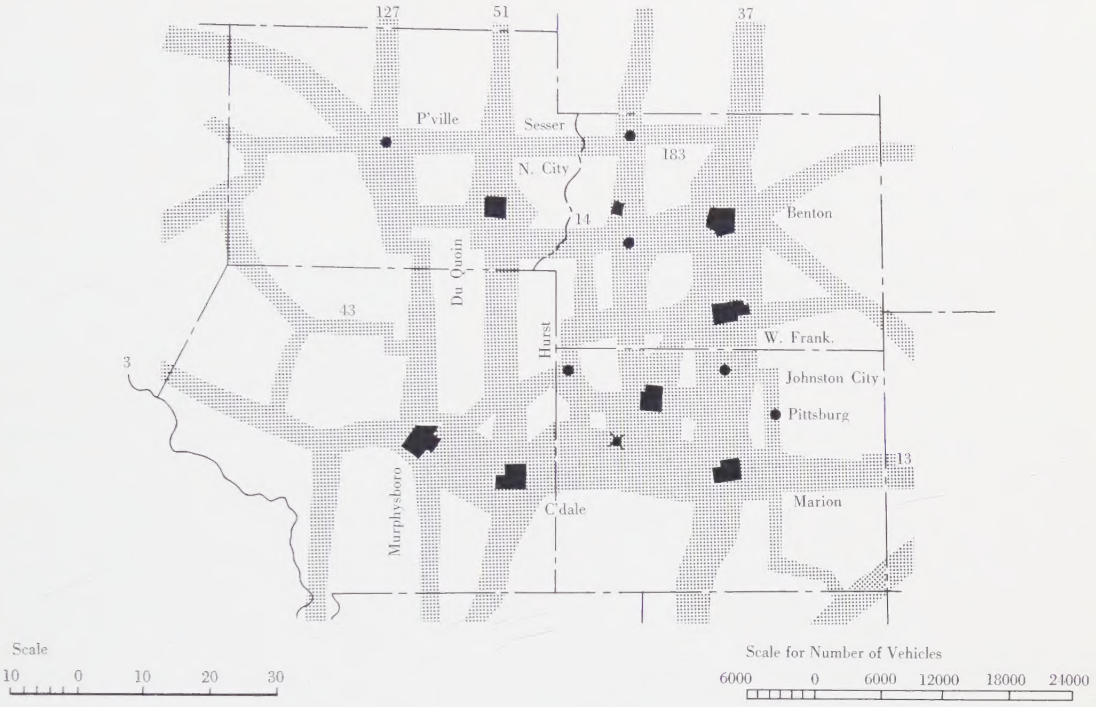
**Southern Illinois Business Bulletin** **Summer, 1961 Vol. 11, No. 3**

The *Southern Illinois Business Bulletin* is published quarterly by the School of Business, Southern Illinois University, Carbondale. Second class mail privileges authorized at Carbondale, Illinois. Signed articles do not necessarily reflect the views of the *Business Bulletin*, the School of Business, or Southern Illinois University.

Subscription is free

President of the University ..... D. W. Morris
Dean of the School of Business ..... H. J. Rehn
Editor ..... Richard J. Dandeneau
Editorial Board ..... Henry J. Rehn
Milton T. Edelman
Richard J. Dandeneau

## FIGURE 1
## TRAFFIC FLOW IN THE CRAB ORCHARD DISTRICT




## FIGURE 2
## CARTERVILLE'S POPULATION IN RELATION TO COAL MINING ACTIVITY

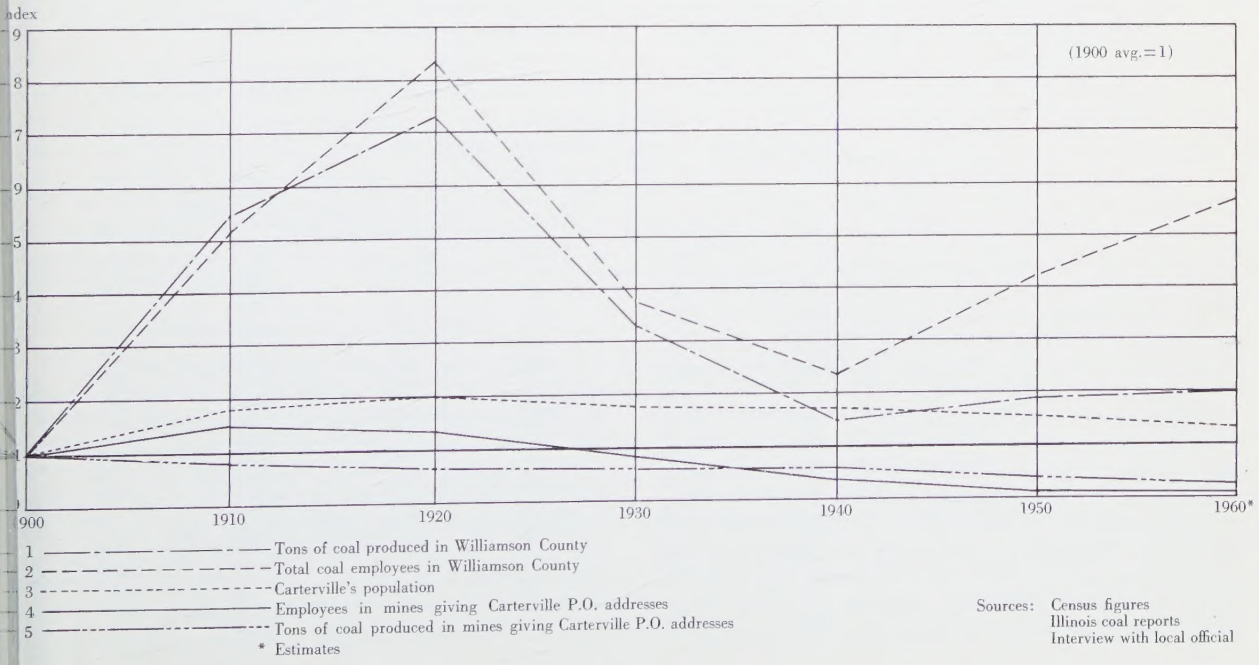


TABLE I
Population of Selected Southern Illinois Cities

| City | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960* |
|---|---|---|---|---|---|---|---|
| Carterville | 1,749 | 2,971 | 3,404 | 2,866 | 2,882 | 2,716 | 2,626 |
| Herrin | 1,559 | 6,861 | 10,986 | 9,708 | 9,352 | 9,331 | 9,428 |
| Johnston City | 787 | 3,248 | 7,137 | 5,955 | 5,418 | 4,479 | 3,853 |
| West Frankfort | | 2,111 | 8,478 | 14,683 | 12,383 | 11,384 | 9,004 |

Source: Census figures, 1900–1950
*1960 preliminary census data

Seventy-five per cent of the population was contacted in the home survey with approximately 750 questionnaires being completed.

*Employment of Residents*

The tabulated survey data is summarized in Table II. The total number employed in the various categories has been divided into the number who work within Carterville and those who commute to other areas. Of the 886 total resident-workers in Carterville, only 301 or 34% find employment within the city. Almost twice that amount or 66% find it necessary to commute for their employment.

Table II shows that 27% of Carterville's workers are employed in manufacturing. This percentage is not especially high, but the fact that 95% of those engaged in manufacturing are commuters is significant. This means that, although there is little manufacturing in the city, it is still a very important source of employment to Carterville residents. Other services are second in importance as a field of employment. Seventeen per cent of Carterville's workers are employed in this category, with about two-thirds of the workers employed in Carterville establishments. Educational services offered employment to 100 resident workers. Twenty-eight per cent of these workers were employed in Carterville, leaving 72% as commuters. The high percentage in the educational field which are commuters is undoubtedly due to employment at Southern Illinois University and Vocational Technical Institute, which offer employment to many residents in areas surrounding Carbondale.

Almost 11% of Carterville's workers were employed in retail trade with 57% working in the city and the other 43% commuting. Another feature of Table II is that only 8% of the resident-workers are now employed in mining. Also, it should be noted that construction is highly seasonal in character which means that when construction is not in its booming period, those persons employed in construction (3%) would most likely be employed in another field.

Other questionnaire data reveal that manufacturing employs an almost equal ratio of men to women. Men constituted 51% of the manufacturing force, while women composed 49%. It is also significant that 42% of the total female working force are employed in manufacturing, considering that the next field in which the largest number of women is employed is retail trade with only 14%. These figures indicate that most of the manufacturing could be classified as light since heavy industries generally employ a much higher number of men in comparison to women.

TABLE II
Employment of Carterville Residents

| Activity | Total | Per Cent of Total | *Work in Carterville* Commuters | | | |
|---|---|---|---|---|---|---|
| | | | No. | Per Cent of Category | No. | Per Cent of Category |
| Manufacturing | 237 | 27 | 12 | 5 | 225 | 95 |
| Other Services | 151 | 17 | 96 | 64 | 55 | 36 |
| Education | 100 | 11 | 28 | 28 | 72 | 72 |
| Retail Trade | 96 | 11 | 55 | 57 | 41 | 43 |
| Mining | 72 | 8 | 24 | 33 | 48 | 67 |
| Unclassified | 56 | 6 | 24 | 43 | 32 | 57 |
| Professional | 50 | 6 | 20 | 40 | 30 | 60 |
| Government | 42 | 5 | 20 | 48 | 22 | 52 |
| Transportation and Utilities | 36 | 4 | 8 | 22 | 28 | 78 |
| Construction | 28 | 3 | 6 | 21 | 22 | 79 |
| Wholesale Trade | 9 | 1 | – | | 9 | 100 |
| Entertainment | 9 | 1 | 8 | 89 | 1 | 11 |
| Totals | 886 | 100 | 301 | — | 585 | — |

*Employment in Establishments of Carterville*

Only 31 persons, or 10% of the 332 total workers in Carterville, in-commute from other areas within a 15-mile radius. Commuting to Carterville is of minor importance in comparison to the great percentage of people commuting from Carterville.

Table III shows the employment situation within the establishments of Carterville. Services are of first importance in Carterville establishments. A total of 157 jobs are provided through various services with the category entitled "other services" leading with 96 employees. Retail trade is second in importance. Eighty-five per cent of the establishments in Carterville and seventy per cent of the jobs are included in the services and retail trade categories. Educational services is third with 31 employees, and mining ranks fourth with 29 workers.

TABLE III
Employment in Carterville Establishments
Fall, 1959

| Economic Activity | Number of Establishments | Total Employees | Per Cent of Total |
|---|---|---|---|
| Other Services | 30 | 96 | 29 |
| Retail Trade | 29 | 79 | 24 |
| Educational Services | 2 | 31 | 9 |
| Mining | 1 | 29 | 9 |
| Unclassified | | 21 | 6 |
| Government | 3 | 20 | 6 |
| Professional Services | 9 | 20 | 6 |
| Manufacturing | 3 | 12 | 4 |
| Entertainment | 3 | 10 | 3 |
| Transportation and Utilities | 2 | 8 | 2 |
| Construction | 3 | 6 | 2 |
| Totals | 85 | 332 | 100 |

* Figures include commuters.

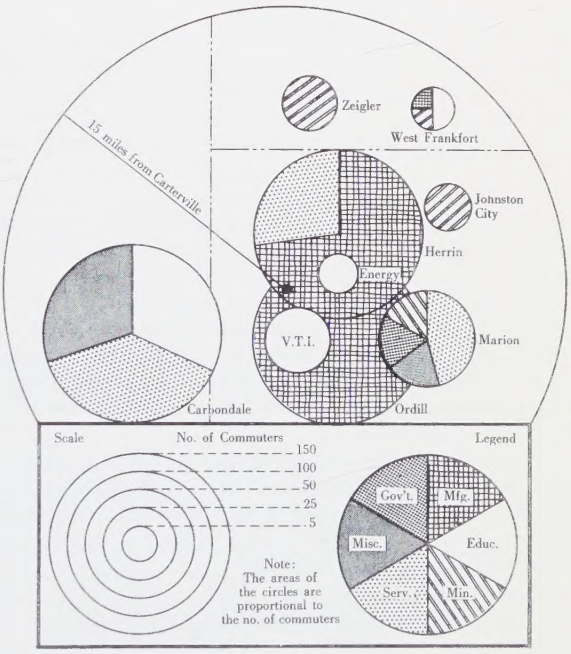
As was pointed out earlier in Table II, sufficient employment for the amount of resident-workers in Carterville cannot possibly be found within the limits of Carterville. From the findings of the questionnaires, it was revealed that only 332 jobs existed in Carterville's establishments, while there were 886 people to be employed. It is evident that commuting to jobs in other places is a necessity to Carterville's residents.

*Commuting From Carterville*

It is now important to note in what cities the people of Carterville do obtain employment and see if there is any special concentration in one area of the Crab Orchard district. Sixty-six per cent of the labor force are commuters, who travel to jobs within a fifteen- to twenty-mile radius of the city. If this commuting were not possible, many of Carterville's residents would be unemployed. The fact that the majority of Carterville's workers find employment in other places leads to the conclusion that the ability to commute actually helps to maintain Carterville's population. One could say that Carterville has a dormitory function, that of providing a home for persons employed in surrounding cities.

The importance of commuting to surrounding cities is shown by Figure 3. The area to which the largest amount of persons commute is Carbondale with 148 people travelling to that city. Next in importance is the Ordill manufacturing area, to which 121 people commute. Herrin is the place of employment for 120 people. Together, these three places account for almost 67% of the commuter travellers. Other places accounting for between seven to 10 per cent of the total include Marion, Vocational Technical Institute, Zeigler, Johnston City, and West Frankfort. An additional 27 communities each received less than one per cent of the total.

FIGURE 3
THE COMMUTING SITUATION OF CARTERVILLE, ILLINOIS




Carbondale provided employment for the largest number of Carterville commuters. Thirty-two per cent of the 148 people who travelled to Carbondale were engaged in education, with Southern Illinois University listed as the place of employment of 45 persons. Services, retail trade, and employment in professional services accounted for 14%, 13%, and 12%, respectively, of the commuters to Carbondale. The employment in these fields is in the business establishments of Carbondale's downtown district. Manufacturing found in such places as Good Luck Glove Factory offered employment to 10% of Carterville commuters. Other fields represented were construction, 7%, and mining, 5%. All remaining groups combined accounted for 7%.

The second largest number of Carterville commuters travelled to the Ordill manufacturing district

where a total of 121 workers found employment. The Sangamo Electric Company offered employment to 48% of the people, while the others worked at the Universal Match Corporation, Olin Mathieson Chemical Corporation, Diagraph Bradley Industries Incorporated, and Grinnel Sash and Door Company. It is significant to notice that 45% of the Carterville commuters to this area are women, an indication of light industry.

Herrin provided jobs for 120 Carterville commuters, largely in manufacturing establishments. Seventy-two per cent of the people worked at such places as Norge Division of Borg Warner, Allen Industries Incorporated, Smoler Brothers Incorporated, and International Stapling and Machine Company. Transportation accounted for 6% while the remaining 22% of the total Carterville commuters to Herrin included no one employment group amounting to more than 5%.

Marion was the fourth largest employer of Carterville commuters. The thirty-five people who found employment in this city were in diversified fields. The Vocational Technical Institute offered employment to 16 in the educational field; Zeigler and Johnston City gave employment to 19 persons, all in the mining category. West Frankfort and Energy employed nine people in diversified fields.

It is significant to see, then, that Carbondale, the Ordill manufacturing district, and Herrin were the places to which the greatest number of Carterville commuters travelled. Twenty-five per cent of the commuters travel to Carbondale, while 21% each commute to the Ordill area and Herrin. Of major importance in these three areas was manufacturing, which was of prime importance in the entire commuting picture. These three places range from five to eight miles from Carterville.

Ninety-seven per cent of all Carterville commuters travelled within the confines of the Crab Orchard district. Thus, commuters from Carterville, although mainly going 5 to 8 miles, are willing to travel 15 to 20 miles daily to their jobs.

### *Unemployment Situation*

In the case of Carterville, the unemployed persons represent potential commuters. This study does not give an accurate view of the total picture of unemployment, but from the results of the sample, certain conclusions can be made. The questionnaires received indicated that 72 men listed themselves as unemployed. The number of women who answered that they were unemployed were not counted as it was assumed they were unemployed because many were housewives. Of the 72 cases where the male is unemployed, thirteen of these are unemployed while a female is doing full-time work. The figures on unemployment are not projected to 100%, because the majority of people in the homes not contacted are assumed to be absent from the home at the time of the survey because they were at work.

The figure of 72, which is 8% of the total working force of 886 people, concurs closely with the unemployed civilian labor force of 8½% found in the census figures of 1950.

### *Conclusion*

This employment study presents a cross-section in time of the employment situation in Carterville. The purpose of the study was to look at the structure of employment in Carterville with emphasis being placed on where the residents work and in what fields they are engaged.

In the past Carterville's employment was centered around coal mining. With the decline of employment in that activity, Carterville's labor force and population began to decline and employment had to be found in areas other than mining. The city of Carterville could not provide the jobs necessary to support its worker-residents. Carterville's situation within the Crab Orchard district made it possible for its residents to travel by auto to nearby places for employment. Its population was maintained, and it can be concluded that Carterville in 1959 has successfully changed from a mining community to a town serving a dormitory function.

The two most important factors contributing to Carterville's change in function have been the favorable location it has in respect to the employment opportunities offered by manufacturing concerns at the Ordill manufacturing area and Herrin and the educational facilities at Carbondale and Vocational Technical Institute.

The dependency of Carterville upon the other cities within the Crab Orchard district is great for employment purposes when one considers that 66% of Carterville's workers are commuters. The pattern shown on the traffic flow map indicates the great interaction between all the cities in the Crab Orchard district. This interaction may indicate further the interdependency of all the cities in the district for employment purposes. A study on West Frankfort written by Robert Harper and William Sanders published in the *Southern Illinois Business Bulletin* in the summer of 1956 and an unpublished study on Johnston City written by William Sanders both show dependency of the cities on other cities for employment.

---

## SUGGESTED FORMULAE FOR THE COMPUTATION OF ACCELERATED DEPRECIATION

**by Leo Favrot**

The Internal Revenue Code of 1954, following most current literature on the subject, permits a "reasonable allowance" for depreciation (including obsolescence) computed "under any of the following methods:

(1) the straight line method,

(2) the declining balance method, using a rate not exceeding twice the rate which would have been used had the annual allowance been computed under the method described in paragraph (I),

*Leo Favrot is an associate professor in the Department of Accounting at Southern Illinois University. Mr. Favrot has an M.B.A. degree and is a Certified Public Accountant.*

(3) the sum of the years-digits method, and
(4) any other consistent method productive of an annual allowance which, when added to all allowances for the period commencing with the taxpayer's use of the property and including the taxable year, does not, during the first two-thirds of the useful life of the property, exceed the total of such allowances which would have been used had such allowances been computed under the method described in paragraph (2)."

For the purpose of this discussion, all computations are based on the following example:

*An item of depreciable property originally costing $1,150 is estimated to have a useful life of ten years, after which its scrap value is estimated to be $150.*

Table I gives the computation of depreciation by each of the first three methods suggested by Section 167 of the Code.

Since most business organizations prepare monthly reports at least for internal consumption, one of the objections to methods (2) and (3) above is that there is such a drastic decline in monthly depreciation from the end of one year to the beginning of the next. Thus:

(2) Under the declining balance method the reduction amounts to 20% each year.
(3) Under the sum of the years-digits method the decline in monthly depreciation is $1.515 each year, which increases in percentage from 10% between the first and second years to 50% between the ninth and tenth years.

In order to eliminate this drastic reduction in monthly depreciation from one year to the next it is proposed that

(4) the method of computing declining balance be based on applying a fixed rate to the book value at the end of each month instead of each year and
(5) the sum of the months-digits be used in place of the sum of the years-digits.

If these two methods are applied to our illustration, the two methods of computation would be as follows:

(4) A rate of 1/60th would be applied to the book value at the beginning of each month. (10 years=120 months; 1/120th equals the straight line rate; 1/60th equals the maximum declining balance rate since 2 times 1/120 equals 1/60.)
(5) The fractions to be applied to $1,000 would be 120/7260ths; 119/7260ths; 118/7260ths; . . . 1/7260ths for each successive 120 months instead of 10/55ths; 9/55ths; 8/55ths; . . . 1/55ths for each successive ten years.

Applying the two methods outlined above, the resulting comparative figures are shown in Table II.

It will be noted by the comparison of the figures above that method (4) does not differ greatly from method (2) and method (5) does not differ greatly from method (3). At the end of the first two-thirds of the life of the equipment neither method (4) nor method (5) accumulates an excessive amount of depreciation when compared to method (2), so either method should be acceptable to the Internal Revenue Service. Figure 1 (page 10) shows a com-

TABLE I—COMPUTATION OF DEPRECIATION BY THE THREE MOST FREQUENTLY MENTIONED METHODS

| | (1) Straight Line Method | | | (2) Declining Balance Method* | | | (3) Sum of the Years-Digits Methods | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Annual Depreciation | Monthly Depreciation | Book Value at end of Year | Annual Depreciation | Monthly Depreciation | Book Value at end of Year | Annual Depreciation | Monthly Depreciation | Book Value at end of Year |
| 1 | 100.00 | 8.33 | 1050 | 230.00 | 19.17 | 920.00 | 181.82 | 15.15 | 968.18 |
| 2 | 100.00 | 8.33 | 950 | 184.00 | 15.33 | 736.00 | 163.64 | 13.64 | 804.54 |
| 3 | 100.00 | 8.33 | 850 | 147.20 | 12.27 | 588.80 | 145.45 | 12.12 | 659.09 |
| 4 | 100.00 | 8.33 | 750 | 117.76 | 9.81 | 471.04 | 127.27 | 10.61 | 531.82 |
| 5 | 100.00 | 8.33 | 650 | 94.21 | 7.85 | 376.83 | 109.09 | 9.09 | 422.73 |
| 6 | 100.00 | 8.33 | 550 | 75.37 | 6.28 | 301.46 | 90.91 | 7.58 | 331.82 |
| 7 | 100.00 | 8.33 | 450 | 60.29 | 5.02 | 241.17 | 72.73 | 6.06 | 259.09 |
| 8 | 100.00 | 8.33 | 350 | 48.23 | 4.02 | 192.94 | 54.55 | 4.55 | 204.54 |
| 9 | 100.00 | 8.33 | 250 | 38.59 | 3.22 | 154.35 | 36.36 | 3.03 | 168.18 |
| 10 | 100.00 | 8.33 | 150 | 4.35 | | 150.00 | 18.18 | 1.52 | 150.00 |
| Total Depreciation for 6 2/3 Years | $666.67 | | | $898.74 | | | $866.66 | | |

* Based on 20% of the book value at the beginning of each year. (20% equals twice 10%, the straight line rate.)

Without the $150.00 scrap value the depreciation for the 10th year would have amounted to $30.87 or $2.57 per month. Because of the $150.00 scrap value, only $4.35 depreciation can be taken in the tenth year. This could be written off over the first two months.

TABLE II

| | Declining Balance Method | | Sum of the Digits Method | |
|---|---|---|---|---|
| | *Yearly* | *Monthly* | *Yearly* | *Monthly* |
| | (2) | (4) | (3) | (5) |
| Depreciation First Month | 19.17 | 19.17 | 15.15 | 16.53 |
| Depreciation Twelfth Month | 19.17 | 15.94 | 15.15 | 15.02 |
| Depreciation Thirteenth Mo. | 15.33 | 15.66 | 13.64 | 14.87 |
| Cumulative Depreciation: First Year (12 months) | 230.00 | 210.05 | 181.82 | 189.26 |
| First 6 2/3 Years (80 months) | 898.74 | 850.25 | 866.66 | 887.05 |
| Book value at the end of ten years (120 months) | 150.00* | 153.03 | 150.00 | 150.00 |

* By the yearly declining balance method the value is reduced to $150.00 early in the 10th year. (See Table I.)

parison of the successive book values at the end of each month among methods (1), (4), and (5). Note the even decline in book values by all three methods.

Method (4), the declining monthly balance method, follows a pattern of having each month's depreciation decline 1 2/3% from the preceding month. (1/60=1 2/3%.) On the other hand, method (5), the sum of the months-digits method, follows a pattern of having the depreciation for each month decline 13 281/363c from the preceding month (1/7260×$1,000=13 281/363c).

These are somewhat inflexible methods of computing accelerated depreciation by:

(4) having each month's depreciation decline by only one fixed percentage from the preceding month or

(5) having each month's depreciation decline by only one fixed amount from the preceding month.

Why not develop general formulae by which the depreciation for each successive month will be:

(6) X% less than the depreciation for the preceding month or

(7) Y amount less than the depreciation for the preceding month? Such formulae have been developed.

Applying the formulae developed for (6) above, it is found that the largest percentage of decline in depreciation that could be taken for tax purposes according to the present Internal Revenue Code would be 2.2%, if the percentage is carried only to the nearest one tenth of 1%, which is close enough for our illustration. The percentage could be any amount less than 2.2%. Computations were, in fact, made for 0.5%; 1%; 1.5%; and 2%. A summary of the resulting comparative figures are shown in Table III.

It will be noted by the comparison of the figures in Table III that: the results by method (4) fall between the results by application of 1.5% and 2% to method (6); and the results by application of 2.2% to method (6) are the nearest to the legal limit set forth in the Internal Revenue Code by method (2). Figure 2 (page 11) shows a comparison of successive book values at the end of each month among methods (4) and (6), using 0.5% and 2.2% in applying method (6).

Applying the formulae determined for (7) above to the illustration, it is found that the largest fixed amount of decline in depreciation that could be taken for tax purposes would be 14c per month, which is not very different from the 13 281/363c found in the sum of the months-digits method. The difference of 14c is also the greatest difference that can be used and still have an amount to depreciate in the 120th month, which is found to be 14c. The amount could be any amount less than 14c, computations were, in fact, made for 2½c; 5c; 10c; and 13c. A summary of the resulting comparative figure is shown in Table IV.

The difference between the results of the sum of the months-digits method (5) and the application of the 14c differential to method (7) is negligible. Figure 3 (page 11) shows a comparison of successive book values at the end of each month among methods (5) and (7), using 2½c and 14c in applying method (7).

TABLE III

| | Declining Balance Method | | (6) Each month's depreciation is X% less than in the preceding month | | | | |
|---|---|---|---|---|---|---|---|
| | *Yearly* | *Monthly* | | | | | |
| | (2) | (4) | X=0.5% | X=1% | X=1.5% | X=2% | X=2.2% |
| Depreciation—First Month | 19.17 | 19.17 | 11.06 | 14.27 | 17.92 | 21.94 | 23.64 |
| Depreciation—Twelfth Month | 19.17 | 15.94 | 10.47 | 12.18 | 15.17 | 17.57 | 18.51 |
| Depreciation—Thirteen Month | 15.33 | 15.66 | 10.41 | 12.65 | 14.95 | 17.21 | 18.10 |
| Cumulative Depreciation: First Year (12 months) | 230.00 | 210.05 | 129.15 | 162.16 | 198.18 | 236.20 | 251.73 |
| First 6 2/3 Years (80 months) | 898.74 | 850.25 | 730.84 | 788.55 | 838.21 | 879.19 | 893.19 |

TABLE IV

| | (2) Yearly Declining Balance Method | (5) Sum of the Months-Digits Method | (7) Each Month's Depreciation is Y Amount Less than in the Preceding Month | | | | |
|---|---|---|---|---|---|---|---|
| | | | Y=2½c | Y=5c | Y=10c | Y=13c | Y=14c |
| Depreciation—First Month | 19.17 | 16.53 | 9.82 | 11.31 | 14.28 | 16.07 | 16.66 |
| Depreciation—Twelfth Month | 19.17 | 15.02 | 9.55 | 10.76 | 13.18 | 14.64 | 15.12 |
| Depreciation—Thirteen Month | 15.33 | 14.87 | 9.52 | 10.71 | 13.08 | 14.51 | 14.98 |
| Cumulative Depreciation: | | | | | | | |
| First Year (12 months) | 230.00 | 189.26 | 116.20 | 132.40 | 164.80 | 184.24 | 195.72 |
| First 6 2/3 Years (80 Months) | 898.74 | 887.05 | 706.67 | 746.67 | 826.67 | 874.67 | 890.40 |

*Summary*

It is felt that the use of the recommended formulae for methods (6) and (7) have certain advantages in special situations for the following reasons:

1. Management may be presented with the two sets of formulae for solving the problem of computation of accelerated depreciation under the following two possible assumptions:
   a. Periodic depreciation decreases by a certain fixed percentage from the depreciation of the previous period, or
   b. Periodic depreciation decreases by a certain fixed amount from the depreciation of the previous period.
2. Any reasonable fixed percentage or amount can be used in (a) or (b) taking into consideration the arbitrary legal limits established by the Internal Revenue Code. The formulae are, therefore, completely flexible.
3. In the case of the declining balance method the No. 6 formulae eliminate the problem of never reaching zero or having to use a very unpredictable formula for reaching a predetermined scrap value after a predetermined period of time.
4. The formulae can just as easily be applied on a declining monthly basis as on a yearly basis.
5. It is believed that these formulae can be easily applied to group depreciation.

The formulae used in the above computations are given in Table V (page 10). Some of these formulae may appear somewhat formidable at first glance; but they are quite easy to apply by the use of an adequate table of logarithms or a modern computer. Both a 10-place table of natural logarithms and an IBM 650 were used in the preparation of the data used in this paper. The Southern Illinois University Mathematics Department and Computing Center cooperated with the author in developing the formulae and data required. The programs used on the 650 for the preparation of data found in this article are available on request from the Accounting Department, School of Business, Southern Illinois University, Carbondale, Illinois.

Table VI (page 12) gives the cumulative depreciation by years for all seven methods with the five computations each under methods (6) and (7). This table is given for overall comparison purposes.

Tables V and VI and Figures 1, 2, and 3 of Professor Favrot's article appear on pages 10 through 12. Table V and Figure 1 are on page 10; Figures 2 and 3 are on page 11; and Table VI is on page 12.

TABLE V. LIST OF FORMULAE FOR METHODS (1) THROUGH (7)

| Method | Depreciation: First Month | Depreciation: Nth Month | Depreciation: Nth Year | Cumulative Depreciation—End of: Nth Month | Cumulative Depreciation—End of: Nth Year |
|---|---|---|---|---|---|
| (1) Straight Line | $\frac{C-S}{m}$ | $\frac{C-S}{m}$ | $\frac{C-S}{y}$ | $\frac{(C-S)N}{m}$ | $\frac{(C-S)N}{y}$ |
| Declining Balance: | | | | | |
| (2) Yearly | $\frac{2C}{12\ y}$ | – | $\frac{2C}{y}\left(1-\frac{2}{y}\right)^{N-1}$ | – | $C\left[1-\left(1-\frac{2}{y}\right)^{N}\right]$ |
| (4) Monthly | $\frac{2C}{m}$ | $\frac{2C}{m}\left(1-\frac{2}{m}\right)^{N-1}$ | – | $C\left[1-\left(1-\frac{2}{m}\right)^{N}\right]$ | – |
| Sum of Digits: | | | | | |
| (3) Years | $\frac{2(C-S)y}{12(y^2+y)}$ | – | $\frac{2(C-S)\ (y+1-N)}{y^2+y}$ | – | $\frac{N(C-S)\ (2y+1-N)}{y^2+y}$ |
| (5) Months | $\frac{2(C-S)m}{m^2+m}$ | $\frac{2(C-S)(m+1-N)}{m^2+m}$ | – | $\frac{N(C-S)\ (2m+1-N)}{m^2+m}$ | – |
| (6) Fixed Percentage of Monthly Decline | $\frac{X(C-S)}{1-(1-X)^m}$ | $\frac{X(C-S)}{1-(1-X)m}(1-X)^{N-1}$ | – | $\frac{1-(1-X)^N}{1-(1-X)^m}(C-S)$ | – |
| (7) Fixed Amount of Monthly Decline | $\frac{C-S}{m}+\frac{Y(m-1)}{2}$ | $\frac{C-S}{m}+\frac{Y(m-1)}{2}-Y(N-1)$ | – | $N\left[\frac{C-S}{m}+\frac{Y(m-1)}{2}\right]-\frac{Y(N^2-N)}{2}$ | – |

*LEGEND*

C—Cost of depreciable asset
m—Number of months of estimated useful life
y—Number of years of estimated useful life
S—Estimated scrap value after m months or y years
X—Fixed percentage of monthly decline
Y—Fixed amount of monthly decline

*Amounts Used in the Illustrations*

C = 1,150
m = 120
y = 10
S = 150
X = .005; .01; .015; .02; .022
Y = .025; .05; .10; .13; .14

FIGURE 1. COMPARISON OF DEPRECIATION COMPUTATIONS ACCORDING TO METHODS (1), (4) & (5)

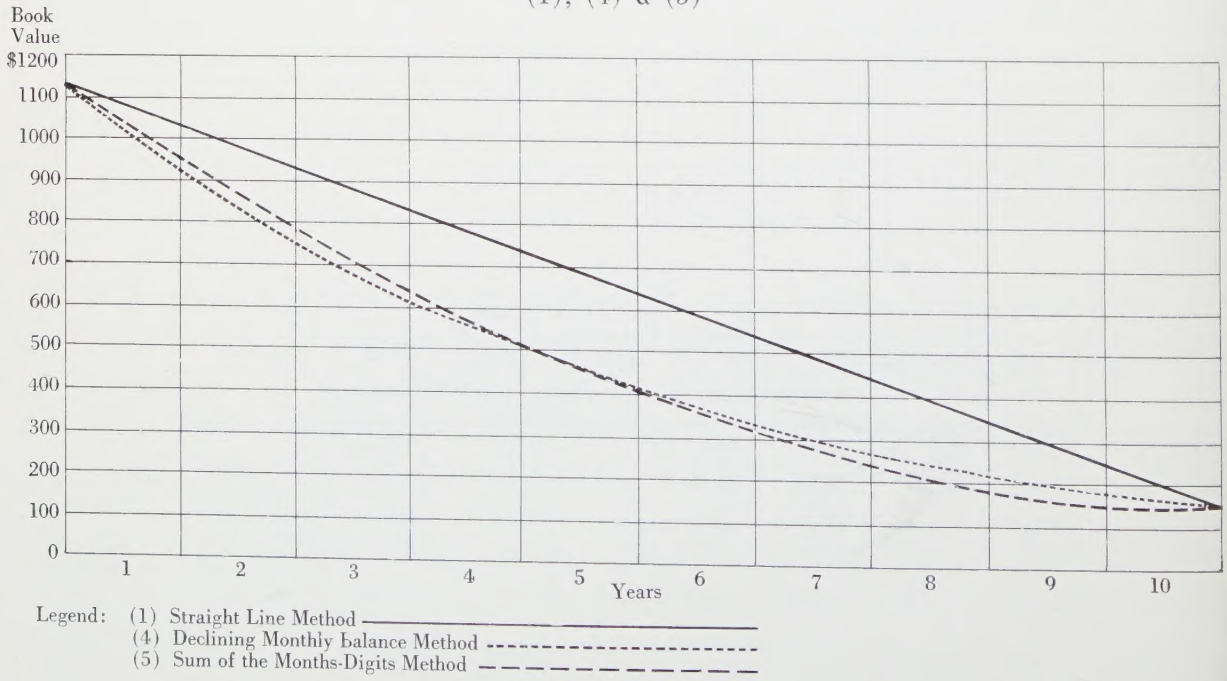
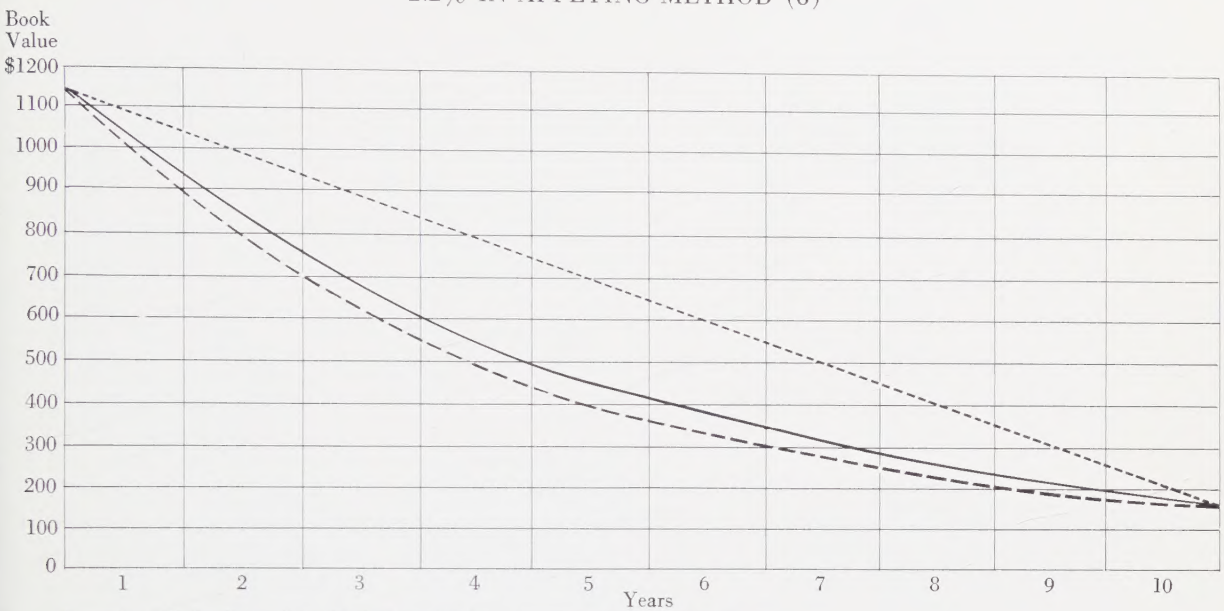
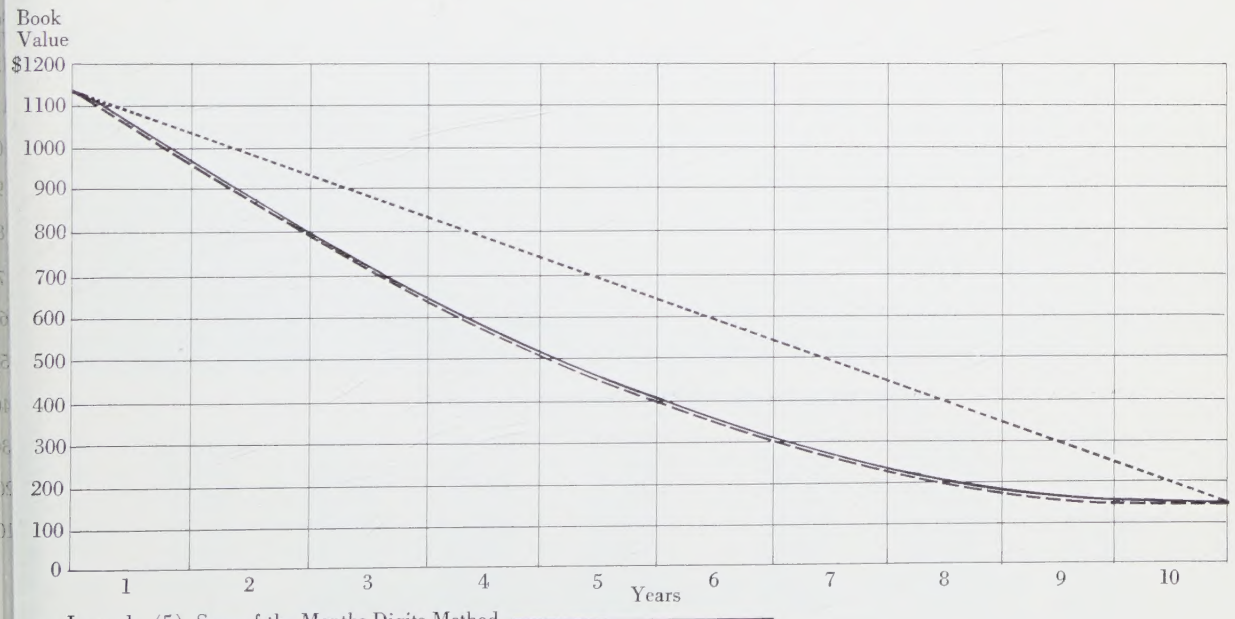


FIGURE 2. COMPARISON OF DEPRECIATION COMPUTATIONS ACCORDING TO METHODS (4) AND (6) USING 0.5% AND 2.2% IN APPLYING METHOD (6)




Legend: (4) Declining Monthly Balance Method ——————
(6) Fixed Percentage of Monthly Decline Method
With 0.5% of Decline - - - - - - - - - - - - - - - - - - - - - - - -
With 2.2% of Decline — — — — — — — — — — — —

FIGURE 3. COMPARISON OF DEPRECIATION COMPUTATIONS ACCORDING TO METHODS (5) AND (7) USING 2½c AND 14c IN APPLYING METHOD (7)




Legend: (5) Sum of the Months-Digits Method ——————
(7) Fixed Amount of Monthly Decline Method
With 2½c of Decline - - - - - - - - - - - - - - - - - - - - - - - -
With 14c of Decline — — — — — — — — — — — —

Serials-Acquisitions Librarian
University of Illinois Library
Chicago Undergraduate Division
Navy Pier
Chicago 11, Illinois



TABLE VI

COMPARISON OF YEARLY AND CUMULATIVE DEPRECIATION FOR METHODS AND FACTORS DISCUSSED IN THIS ARTICLE

*Yearly Depreciation*

| Year: | (1) Straight Line Method | (2) Declining Yearly Balance Method | (3) Sum of Years-Digits Method | (4) Declining Monthly Balance Method | (5) Sum of Months-Digits Method | (6) Fixed Percentage of Monthly Decline Method | |
|---|---|---|---|---|---|---|---|
| | | | | | | 0.5% | 1.0% |
| 1 | 100.00 | 230.00 | 181.82 | 210.05 | 189.26 | 129.15 | 162.16 |
| 2 | 100.00 | 184.00 | 163.64 | 171.68 | 169.42 | 121.61 | 143.74 |
| 3 | 100.00 | 147.20 | 145.45 | 140.32 | 149.58 | 114.51 | 127.41 |
| 4 | 100.00 | 117.76 | 127.27 | 114.69 | 129.76 | 107.82 | 112.93 |
| 5 | 100.00 | 94.21 | 109.09 | 93.75 | 109.91 | 101.53 | 100.11 |
| 6 | 100.00 | 75.37 | 90.91 | 76.62 | 90.09 | 95.61 | 88.72 |
| 7 | 100.00 | 60.29 | 72.73 | 62.63 | 70.24 | 90.02 | 78.65 |
| 8 | 100.00 | 48.23 | 54.55 | 51.19 | 50.42 | 84.77 | 69.71 |
| 9 | 100.00 | 38.59 | 36.36 | 41.84 | 30.58 | 79.81 | 61.80 |
| 10 | 100.00 | 4.35 | 18.18 | 34.20 | 10.74 | 75.16 | 54.77 |

*Yearly Depreciation* (Continued)

| Year: | (6) Fixed Percentage of Monthly Decline Method (*Continued*) | | | (7) Fixed Amount of Monthly Decline Method | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1.5% | 2.0% | 2.2% | 2½c | 5c | 10c | 13c | 14c |
| 1 | 198.18 | 236.20 | 251.73 | 116.20 | 132.40 | 164.80 | 184.24 | 190.72 |
| 2 | 165.32 | 185.34 | 192.75 | 112.60 | 125.20 | 150.40 | 165.52 | 170.56 |
| 3 | 137.89 | 145.45 | 147.59 | 109.00 | 118.00 | 136.00 | 146.80 | 150.40 |
| 4 | 115.02 | 114.13 | 113.02 | 105.40 | 110.80 | 121.60 | 128.08 | 130.24 |
| 5 | 95.94 | 89.56 | 86.53 | 101.80 | 103.60 | 107.20 | 109.36 | 110.08 |
| 6 | 80.03 | 70.28 | 66.26 | 98.20 | 96.40 | 92.80 | 90.64 | 89.92 |
| 7 | 66.75 | 55.15 | 50.74 | 94.60 | 89.20 | 78.40 | 71.92 | 69.76 |
| 8 | 55.68 | 43.28 | 38.85 | 91.00 | 82.00 | 64.00 | 53.20 | 49.60 |
| 9 | 46.45 | 33.96 | 29.75 | 87.40 | 74.80 | 49.60 | 34.48 | 29.44 |
| 10 | 38.74 | 26.65 | 22.78 | 83.80 | 67.60 | 35.20 | 15.76 | 9.28 |

*Accumulated Depreciation*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 100.00 | 230.00 | 181.82 | 210.05 | 189.26 | 129.15 | 162.16 | |
| 2 | 200.00 | 414.00 | 345.46 | 381.73 | 358.68 | 250.76 | 305.90 | |
| 3 | 300.00 | 561.20 | 490.91 | 522.05 | 508.26 | 365.27 | 433.31 | |
| 4 | 400.00 | 678.96 | 618.18 | 636.74 | 638.02 | 473.09 | 546.24 | |
| 5 | 500.00 | 773.17 | 727.27 | 730.49 | 747.93 | 574.62 | 646.35 | |
| 6 | 600.00 | 848.54 | 818.18 | 807.11 | 838.02 | 670.23 | 735.07 | |
| 7 | 700.00 | 908.83 | 890.91 | 869.74 | 908.26 | 760.25 | 813.72 | |
| 8 | 800.00 | 957.06 | 945.46 | 920.93 | 958.68 | 845.02 | 883.43 | |
| 9 | 900.00 | 995.65 | 981.82 | 962.77 | 989.26 | 924.83 | 945.23 | |
| 10 | 1000.00 | 1000.00 | 1000.00 | 996.97 | 1000.00 | 999.99 | 1000.00 | |

*Accumulated Depreciation* (Continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 198.18 | 236.20 | 251.73 | 116.20 | 132.40 | 164.80 | 184.24 | 190.72 |
| 2 | 363.50 | 421.54 | 444.48 | 228.80 | 257.60 | 315.20 | 349.76 | 361.28 |
| 3 | 501.39 | 566.99 | 592.07 | 337.80 | 375.60 | 451.20 | 496.56 | 511.68 |
| 4 | 616.41 | 681.12 | 705.09 | 443.20 | 486.40 | 572.80 | 624.64 | 641.92 |
| 5 | 712.35 | 770.68 | 791.62 | 545.00 | 590.00 | 680.00 | 734.00 | 752.00 |
| 6 | 792.38 | 840.96 | 857.88 | 643.20 | 686.40 | 772.80 | 824.64 | 841.92 |
| 7 | 859.13 | 896.11 | 908.62 | 737.80 | 775.60 | 851.20 | 896.56 | 911.68 |
| 8 | 914.81 | 939.39 | 947.47 | 828.80 | 857.60 | 915.20 | 949.76 | 961.28 |
| 9 | 961.26 | 973.35 | 977.22 | 916.20 | 932.40 | 964.80 | 984.24 | 990.72 |
| 10 | 1000.00 | 1000.00 | 1000.00 | 1000.00 | 1000.00 | 1000.00 | 1000.00 | 1000.00 |